WHAT IS CLAIMED IS:

1. An ultrasonic surgical guidance imaging system which acts to guide the placement or observe the operation of an invasive medical device (30) comprising:

an ultrasonic probe (10) including an array transducer which steers ultrasonic beams over a volumetric surgical region (120) for image guidance of the placement or operation of an invasive medical device (30);

a transmit beamformer coupled to the array transducer which acts to control the array transducer to transmit a greater beam density in the volumetric region (120) in the vicinity of the invasive medical device (30);

a receive beamformer coupled to the array transducer and responsive to echo signals from array elements for the formation of beams of coherent echo signals;

an image processor (14) responsive to the coherent echo signals for producing a three dimensional ultrasonic image of the volumetric surgical region (120) and the invasive medical device (30); and

a display (18) coupled to the image processor (14) which displays the three dimensional ultrasonic image of the volumetric surgical region (120) and the invasive medical device (30).

2. The ultrasonic surgical guidance imaging system of Claim 1, wherein the transmitted beam density in a subvolumetric region in the vicinity of the invasive medical device (30) is uniformly more dense than the beam density of the volumetric region (120) surrounding the subvolumetric region.

3. The ultrasonic surgical guidance imaging system of Claim 2, wherein the transmitted density is relatively high in the subvolumetric region in the vicinity of the invasive medical device (30), and is relatively low in regions of the volumetric region (120) surrounding the subvolumetric region.

4. The ultrasonic surgical guidance imaging system of Claim 1, wherein the transmitted beam density is relatively high in the volumetric region (120) in

the vicinity of the invasive medical device (30), is relatively less at a given distance from the invasive medical device (30), and exhibits one or more intermediate densities at distances less than the given distance.

5. The ultrasonic surgical guidance imaging system of Claim 4, wherein the transmitted beam density progressively declines with increasing distances or angles from the invasive medical device (30).

6. The ultrasonic surgical guidance imaging system of Claim 5, wherein the transmitted beam density progressively declines with increasing distances from the invasive medical device (30) until a threshold minimum beam density is attained.

7. A method of ultrasonically guiding the placement or observing the operation of an invasive medical device (30) comprising:

transmitting ultrasonic beams over a volumetric region (120) which includes the location of an invasive medical device (30);

controlling the beam density of the ultrasonic beams transmitted in the volumetric region (120) to be relatively high in the vicinity of the invasive medical device (30), and to be relatively low at distances of the volumetric region (120) removed from the invasive medical device (30);

receiving echo signals from the volumetric region (120) in response to the transmitted beams;

processing the received echoes to produce a three dimensional ultrasonic image of the volumetric region (120) and the invasive medical device (30); and

displaying the three dimensional ultrasonic image of the volumetric surgical region (120) and the invasive medical device (30).

8. The method of Claim 7, wherein controlling the beam density further comprises controlling the beam density of the ultrasonic beams transmitted in a subvolumetric region surrounding the invasive medical device (30) to be uniformly high

in relation to the beam density in the volumetric region (120) surrounding the subvolumetric region.

9. The method of Claim 7, wherein controlling the beam density further comprises controlling the beam density to decline to progressively lesser beam densities with increasing distances from the invasive medical device (30).

10. The method of Claim 9, wherein controlling the beam density further comprises controlling the beam density to decline to a minimum beam density level at distances from the invasive medical device (30).

11. A method of ultrasonically guiding the placement or observing the operation of an invasive medical device (30) comprising:

transmitting ultrasonic beams over a volumetric region (120) which includes the location of an invasive medical device (30);

identifying the location of the invasive medical device (30) in the volumetric region (120);

controlling the beam density of the ultrasonic beams transmitted in the volumetric region (120) to be relatively high in the vicinity of the identified location of the invasive medical device (30), and to be relatively low at distances of the volumetric region (120) removed from the invasive medical device (30);

receiving echo signals from the volumetric region (120) in response to the transmitted beams;

processing the received echoes to produce a three dimensional ultrasonic image of the volumetric region (120) and the invasive medical device (30); and

displaying the three dimensional ultrasonic image of the volumetric surgical region (120) and the invasive medical device (30).

12. The method of Claim 11, wherein identifying the location of the invasive medical device (30) comprises image processing ultrasonic echo data.

13. The method of Claim 11, wherein identifying the location of the invasive medical device (30) comprises receiving signals by the invasive medical device (30).

14. The method of Claim 13, wherein identifying the location of the invasive medical device (30) comprises receiving signals by the invasive medical device (30) in the acoustic, radio frequency, or electromagnetic spectrum.

15. The method of Claim 11, wherein identifying the location of the invasive medical device (30) comprises transmitting signals from the invasive medical device (30).

16. The method of Claim 15, wherein identifying the location of the invasive medical device (30) comprises transmitting signals from the invasive medical device (30) in the acoustic, radio frequency, or electromagnetic spectrum.

17. An ultrasonic surgical guidance imaging system which acts to guide the placement or observe the operation of an invasive medical device (30) comprising:

an ultrasonic probe (10) including an array transducer (50) which steers ultrasonic beams over a volumetric surgical region (120) for image guidance of the placement or operation of an invasive medical device (30);

a transmit beamformer coupled to the array transducer (50) which acts to control the spatial beam density of the beams transmitted by the array transducer (50) in the volumetric region (120);

a multiline receive beamformer coupled to the array transducer (50) and responsive to echo signals from array elements for the production of different orders of received multilines in the vicinity of the invasive medical device (30) and in the volumetric region (120) at locations removed from the invasive medical device (30) location;

an image processor (68) responsive to the received multilines for producing a three dimensional ultrasonic image of the volumetric surgical region (120) and the invasive medical device (30); and

a display (18) coupled to the image processor (68) which displays the three dimensional ultrasonic image of the volumetric surgical region (120) and the invasive medical device (30).

18. The ultrasonic surgical guidance imaging system of Claim 17, wherein the multiline receive beamformer acts to produce a greater number of received multilines for each transmit beam in the vicinity of the invasive medical device (30) than the number of received multilines for each transmit beam at locations removed from the invasive medical device location.

19. The ultrasonic surgical guidance imaging system of Claim 17, wherein the multiline receive beamformer acts to produce a lesser number of received multilines for each transmit beam in the vicinity of the invasive medical device (30) than the number of received multilines for each transmit beam at locations removed from the invasive medical device location.

20. The ultrasonic surgical guidance imaging system of Claim 17, wherein the transmit beamformer acts to control the array transducer (50) to transmit a different beam density in the volumetric region (120) in the vicinity of the invasive medical device (30) than the beam density in the volumetric region (120) at locations removed from the invasive medical device location.